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Notice of Allowability	Application No.	Applicant(s)	
	10/644,361	KWAK ET AL.	
	Examiner	Art Unit	
	Vineeta S. Panwalkar	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to *the application filed 8/20/03*.

2. ☒ The allowed claim(s) is/are *1-59*.

3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
   a) ☐ All b) ☐ Some* c) ☐ None of the:
      1. ☐ Certified copies of the priority documents have been received.
      2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
      3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.

5. ☒ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
      1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
   (b) ☒ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date 20061207.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☒ Notice of References Cited (PTO-892)
2. ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
3. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date 6/1/04 and 2/21/06
4. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
5. ☐ Notice of Informal Patent Application
6. ☒ Interview Summary (PTO-413), Paper No./Mail Date *20061207* .
7. ☒ Examiner's Amendment/Comment
8. ☒ Examiner's Statement of Reasons for Allowance
9. ☒ Other *See Continuation Sheet*.

Continuation of Attachment(s) 9. Other: Initialled drawings as per examiners amendment.

DETAILED ACTION

Information Disclosure Statement

1. The information disclosure statements (IDSs) filed 6/1/04 and 2/21/06 fail to comply with 37 CFR 1.98(a)(2), which requires a legible copy of each cited foreign patent document; each non-patent literature publication or that portion which caused it to be listed; and all other information or that portion which caused it to be listed. It has been placed in the application file, but the information referred to therein has not been fully considered. No copy of the reference WO 02/13266 was provided and hence that reference has not been considered. Also, both IDSs list identical references. Hence one of the duplicates (IDS submitted 1/6/04) has been cancelled to avoid repetition of cited references once the patent is published.

Examiner's amendment

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with applicant's representative, Jeffery Glabicki (Reg. No. 42,584) on 12/07/06 (See interview summary form attached herewith).

In the drawings, Fig. 1 and Fig. 3 have been labeled as "Prior Art" because only that which is old is illustrated. Corrected drawings as per examiner's amendment (attached herewith), must be submitted.

Allowable Subject Matter

3. Claims 1- 59 are allowed.

The following is an examiner's statement of reasons for allowance:

3a. Regarding claim 1, prior art of record fails to show a method for detecting data from K data signals transmitted over a shared spectrum in a code division multiple access format, the method comprising: producing a plurality of system matrices and an associated covariance matrix using codes and estimated impulse responses of the K data signals, each system matrix corresponding to a received vector version; extending and approximating the system and covariance matrices as block circulant matrices; determining a diagonal matrix of each of the extended and approximated system and covariance matrices, using a block column of the extended and approximated system and covariance matrices; extending and taking a Fourier transform of each received vector version; taking

products of the diagonal matrices and the extended received vector versions; summing the products; and estimating data of the K data signals using an inverse Fourier transform and the summed products, in combination with each and every other limitation of the claim.

3b. Claims 2-9 are allowed as being dependent on claim 1.

3c. Regarding claim 10, prior art of record fails to show a user equipment for detecting data from K data signals transmitted over a shared spectrum in a code division multiple access format, the user equipment comprising: means for producing a plurality of system matrices and an associated covariance matrix using codes and estimated impulse responses of the K data signals, each system matrix corresponding to a received vector version; means for extending and approximating the system and covariance matrices as block circulant matrices; means for determining a diagonal matrix of each of the extended and approximated system and covariance matrices, using a block column of the extended and approximated system and covariance matrices; means for extending and taking a Fourier transform of each received vector version; means for taking products of the diagonal matrices and the extended received vector versions; means for summing the products; and means for estimating data of the K data signals using an inverse Fourier transform and the summed products, in combination with each and every other limitation of the claim.

3d. Claims 11-19 are allowed as being dependent on claim 10.

3e. Regarding claim 20, prior art of record fails to show a user equipment for detecting data from K data signals transmitted over a shared spectrum in a code division multiple access format, the user equipment comprising: a plurality of compute sub-system matrix blocks for producing a plurality of system matrices using estimated impulse responses of the K data signals, each system matrix corresponding to a received vector version; a compute covariance matrix block for producing a covariance matrix associated with the system matrices; a plurality of extension blocks for extending the system and covariance matrices; a plurality of first block column devices for approximating the extended system and covariance matrices as block circulant matrices; a plurality of block Fourier transform devices for determining a diagonal matrix of each of the extended and approximated system and covariance matrices, using the block column of the extended and approximated system and covariance matrices; an extension device for extending each received vector version; a block Fourier transform device for taking a Fourier transform of each received vector version; a plurality of multipliers for taking products of the diagonal matrices and the extended received vector versions; a summer for summing the products; and a block inverse Fourier transform device for estimating data of the K data signals using an inverse Fourier transform and the summed products, in combination with each and every other limitation of the claim.

3f. Claims 21-27 are allowed as being dependent on claim 20.

3g. Regarding claim 28, prior art of record fails to show a base station for detecting data from K data signals transmitted over a shared spectrum in a code division multiple access format, the base station comprising: means for producing a plurality of system matrices and an associated covariance matrix using codes and estimated impulse responses of the K data signals, each system matrix corresponding to a received vector version; means for extending and approximating the system and covariance matrices as block circulant matrices; means for determining a diagonal matrix of each of the extended and approximated system and covariance matrices, using a block column of the extended and approximated system and covariance matrices; means for extending and taking a Fourier transform of each received vector version; means for taking products of the diagonal matrices and the extended received vector versions; means for summing the products; and means for estimating data of the K data signals using an inverse Fourier transform and the summed products, in combination with each and every other limitation of the claim.

3h. Claims 29-37 are allowed as being dependent on claim 28.

3i. Regarding claim 38, prior art of record fails to show a base station for detecting data from K data signals transmitted over a shared spectrum in a code division multiple access format, the base station comprising: a plurality of compute sub-system matrix blocks for producing a plurality of system matrices using estimated impulse responses of the K data signals, each system matrix corresponding to a

received vector version; a compute covariance matrix block for producing a covariance matrix associated with the system matrices; a plurality of extension blocks for extending the system and covariance matrices; a plurality of first block column devices for approximating the extended system and covariance matrices as block circulant matrices; a plurality of block Fourier transform devices for determining a diagonal matrix of each of the extended and approximated system and covariance matrices, using the block column of the extended and approximated system and covariance matrices; an extension device for extending each received vector version; a block Fourier transform device for taking a Fourier transform of each received vector version; a plurality of multipliers for taking products of the diagonal matrices and the extended received vector versions; a summer for summing the products; and a block inverse Fourier transform device for estimating data of the K data signals using an inverse Fourier transform and the summed products, in combination with each and every other limitation of the claim.

3j. Claims 39-44 are allowed as being dependent on claim 38.

3k. Regarding claim 45, prior art of record fails to show a method for receiving a plurality of data signals transmitted over a shared spectrum in a code division multiple access communication system, the method comprising: determining a system response matrix using the determined channel response and codes of the transmitted data signals; determining a covariance matrix using the system

response matrix; extending the received vector, the system response matrix and the determined covariance matrix; taking a block discrete Fourier transform of a block column of the extended covariance matrix taking a block discrete Fourier transform of a block column of the system response matrix; taking a block discrete Fourier transform of the received vector; and determining an extended data vector using the block discrete Fourier transforms, in combination with each and every other limitation of the claim.

3l. Claims 46 and 47 are allowed as being dependent on claim 45.

3m. Regarding claim 48, prior art of record fails to show a user equipment for detecting data from K data signals transmitted over a shared spectrum in a code division multiple access format, the user equipment comprising: a compute block matrix device for determining a system response matrix using the determined channel response and codes of the transmitted data signals; a compute covariance matrix device for determining a covariance matrix using the system response matrix; a plurality of extend devices for extending the received vector, the system response matrix and the determined covariance matrix; a block discrete Fourier transform device for taking a block discrete Fourier transform of a block column of the extended covariance matrix a block discrete Fourier transform device for taking a block discrete Fourier transform of a block column of the system response matrix; a block discrete Fourier transform device for taking a block discrete Fourier transform of the received vector; and a circuit for

determining an extended data vector using the block discrete Fourier transforms, in combination with each and every other limitation of the claim.

3n. Claims 49 and 50 are allowed as being dependent on claim 48.

3o. Regarding claim 51, prior art of record fails to show a user equipment for detecting data from K data signals transmitted over a shared spectrum in a code division multiple access format, the user equipment comprising: means for determining a system response matrix using the determined channel response and codes of the transmitted data signals; means for determining a covariance matrix using the system response matrix; means for extending the received vector, the system response matrix and the determined covariance matrix; means for taking a block discrete Fourier transform of a block column of the extended covariance matrix means for taking a block discrete Fourier transform of a block column of the system response matrix; means for taking a block discrete Fourier transform of the received vector; and means for determining an extended data vector using the block discrete Fourier transforms, in combination with each and every other limitation of the claim.

3p. Claims 52 and 53 are allowed as being dependent on claim 51.

3q. Regarding claim 54, prior art of record fails to show a base station for detecting data from K data signals transmitted over a shared spectrum in a conde division multiple access format, the base station comprising: a compute block matrix

device for determing a system response matric using the determined channel response and codes of the transmitted data signals; a compute covariance matrix device for determining a covariance matrix using the system response matrix; a plurality of extend ddevices for extending the received vecotr, the systme response matrix and the determined covariance matrix; a block discrete Fourier transform device for taking a block discrete Fourier transform of a block column of the extended covariance matrix A block discrete Fourier transform device for taking a block discrete Fourier transform of a block column of the system response matrix; a block discrete Fourier transform device for taking a block discrete Fourier transform of the received vector; and a circuit for determining an extended data vector using the block discrete Fourier transforms, in combination with each and every other limitation of the claim.

3r. Claims 55 and 56 are allowed as being dependent on claim 54.

3s. Regarding claim 57, prior art of record fails to show a base station for detecting data from K data signals transmitted over a shared spectrum in a code division multiple access format, the base station comprising: means for receiving and sampling a combined signal having the plurality of transmitted data signals to produce a received vector; means for determining a channel response for the plurality of transmitted data signals; means for determining a system response matrix using the determined channel response and codes of the transmitted data signals; means for determining a covariance matrix using the system response

matrix; means for extending the received vector, the system response matrix and the determined covariance matrix; means for taking a block discrete Fourier transform of a block column of the extended covariance matrix means for taking a block discrete Fourier transform of a block column of the system response matrix; means for taking a block discrete Fourier transform of the received vector; and means for determining an extended data vector using the block discrete Fourier transforms, in combination with each and every other limitation of the claim.

3u. Claims 58 and 59 are allowed as being dependent on claim 58.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

4. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- Van Wechel et al. (US 6952460 B1) show system with efficient filtering of interfering signals and covariance calculation.

- Gorokhov et al. (US 2002/0146078 A1) shows multicarrier transmission with extension of covariance matrix and reduced complexity channel estimation and computation of FFT.

Contact Information

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vineeta S. Panwalkar whose telephone number is 571-272-8561. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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TESFALDET BOCURE
PRIMARY EXAMINER

Ex. Ann
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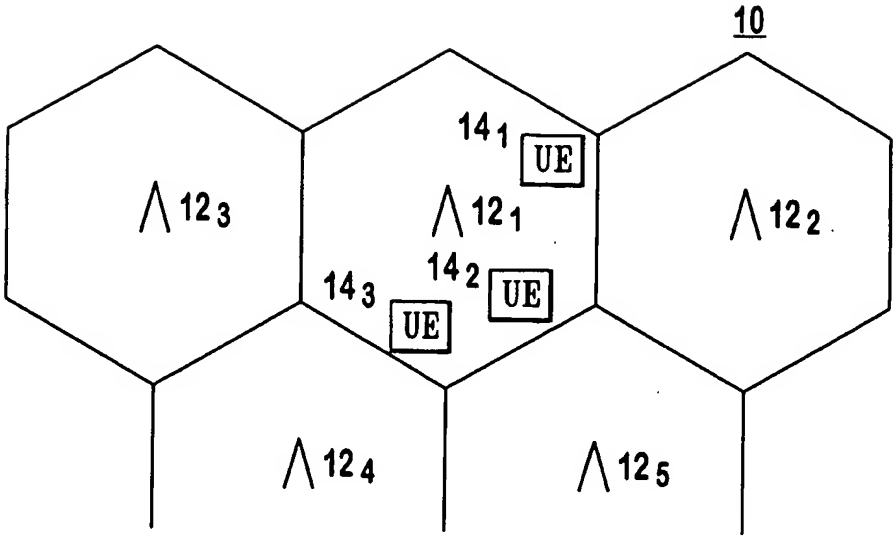

FIG. 1 PRIOR ART

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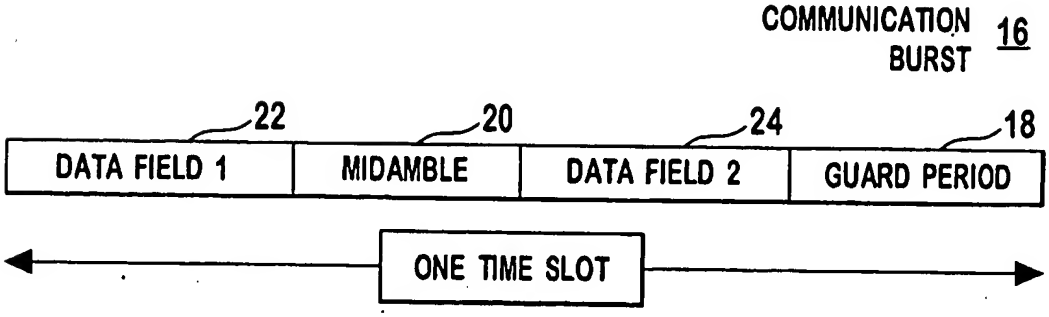

FIG. 3 PRIOR ART